R E M A R K S

Drawings

The Examiner is respectfully requested to approve the drawings.

Telephone Interview with Examiners

A telephone interview was conducted on July 16, 2009. The participants were Supervisory Examiner Jerry Lorengo, Examiner Yun Qian and applicant's attorneys Herbert Goodman and Richard Barth.

During said telephone interview, applicant's attorneys asserted that contrary to the statement on page 3, lines 3 to 6 of the Office Action that USP 4,202,793 to Bezzi et al. in Example 4 teach a tetrahydrofurfuryl alcohol ("THFA") concentration of about 38 volume %, Bezzi et al. teach a THFA concentration of only 34.9 volume %.

Applicant's calculation of 34.9 volume % of THFA was based on the inclusion of 100 cc of aqueous ammonia being present. The

Examiner's calculation of 38 volume % of THFA did not include the 100 cc of aqueous ammonia. For the reasons discussed hereinbelow, applicant's respectfully submit that their calculation of 34.9 volume % of THFA is correct.

As discussed with the Examiners during the interview, the importance of having less than 35 volume % of THFA is demonstrated in the DECLARATION of Masashi TAKAHASHI dated December 22, 2008.

During said telephone interview, applicant's attorneys proposed to amend independent claim 15 to depend on claim 3, and to cancel claim 16. The Examiners said that they would favorably consider the entry of such amendment if the application was in condition for allowance.

Claim Amendments

The amendment to claim 3 by inserting the word "liquid" after "feedstock" inserts a word which was inadvertently omitted when claim 3 was amended. The first paragraph of the Remarks, which submitted the amended claim 3 (see page 8, lines 5 to 8 of

the AMENDMENT UNDER 37 CFR 1.111 filed January 9, 2009), notes that "The feature that the total amount of tetrahydrofurfuryl alcohol in the feedstock is from 40 to 50% is taken from the original claim 5 which is canceled by the present instructions." Original claim 5 stated that the total amount of tetrahydrofurfuryl alcohol in the feedstock liquid is 40 to 50% by volume. It is respectfully submitted that this amendment does not raise a new issue, since claim 3 as previously presented was substantively the same. The present amendment is a clarification.

As discussed hereinabove, to reduce issues, independent claim 15 was amended to depend from claim 3, and claim 16 was canceled.

Minor editorial revisions ere made to claims 17 and 23.

For the reasons discussed hereinabove, entry of the claim amendments is respectfully requested.

Obviousness Rejections Under 35 USC 103

Claims 3, 4, 6 to 11, 15 to 17, 19, 21 and 23 to 26 were rejected under 35 USC 103 as being unpatentable over Hideji et al. (JP 05-279043) in view of Bezzi et al. (USP 4,202,793) for the reasons set forth on pages 2 to 4 of the March 31, 2009 Office Action.

It was admitted in the March 31, 2009 Office Action that Hideji et al. do not specifically teach the concentration of THFA (40 to 50 vol.%) as recited in applicant's claim 3.

Regarding applicant's claims 6 and 19, it was admitted in the March 31, 2009 Office Action that Bezzi et al. fail to teach degassing.

Concerning applicant's claims 8, 17, 21 and 25 to 26, it was admitted in the March 31, 2009 Office Action that Bezzi et al. fail to teach mixing THFA with PVA (polyvinyl alcohol) at least at 50°C.

With respect to applicant's claim 9, it was admitted in the March 31, 2009 Office Action that Hideji et al. fail to teach using dried PVA.

Claims 12 to 14 were rejected under 35 USC 103 as being unpatentable over the references as combined above, and further in view of McLean, II et al. (USP 5,698,173) and Larson et al. (USP 5,514,306) for the reasons beginning at the bottom of page 2 and continuing to the top of page 7 of the March 31, 2009 Office Action.

It was admitted in the March 31, 2009 Office Action that Hideji et al. do not specifically teach the molar ratio of nitric acid to uranium as recited in applicant's claim 12.

It was admitted in the previous Office Action of October 27, 2008 that regarding claim 14, neither Hideji et al. nor Larson et al. specifically teach a chemical treatment for the by-product NOx.

Claims 15 to 17 were rejected under 35 USC 103 as being unpatentable over Hiroji (JP 06-066756) (see page 7, line 14 to page 9, line 3 of the March 31, 2009 Office Action).

It was admitted in the previous Office Action of October 27, 2008 that Hiroji fails to disclose the reaction temperature for making an aqueous PVA solution.

Before discussing the rejection, applicant's claimed invention is discussed to place it in the context of the art, particularly referring to independent claim 3.

The DECLARATION of Masashi TAKAHASHI dated December 22, 2008, which was filed with applicant's AMENDMENT UNDER 37 CFR 1.111 filed January 9, 2009, provided data that "THFA" in a concentration of 40 to 50 vol.% is critical to produce fuel kernels without inside defects.

When the concentration of THFA is less than 40 vol.%, from 1% to about 30% of the produced fuel kernels have inside defects. As discussed in the December 22, 2008 TAKAHASHI DECLARATION, fuel particles having fuel kernels with defects inside them are prone to leak fission gas through the coating layer. Once fission gas leaks through the coating layer out to the nuclear reactor, it quickly expands in the reactor. If many fuel kernels with inside defects are fed to the nuclear reactor, the safety system thereof may be activated and the reactor may be shut down. The shutdown of a nuclear reactor means that the high-temperature gas-cooled reactor can no longer serve its purpose, such as power generation

or hydrogen production. A shutdown of a nuclear reactor usually is publicized in the newspapers and on websites, which often excites uneasiness in the residents near the nuclear plant about the safety thereof.

The sole disclosure in Hideji et al. to tetrahydrofurfuryl alcohol is in paragraph [0011] as follows:

> "...In addition, in this uranyl-nitrate solution, additives, such as a photolysis halt agent and a surfactant for preparing the surface tension of an undiluted solution, may be contained suitably. The matter which is effective in preventing the photolysis (uranium serving as a catalyst) of binder resin as a photolysis halt agent, for example, tetrahydro furil [sic] alcohol, etc., (4HF) can be mentioned."

The foregoing disclosure of the possible use of THFA is for a different purpose than in applicant's claimed process. Most importantly, there is no disclosure of any specific concentration(s) which may be used.

The Office Action relies on Bezzi et al. as follows:

> "Bezzi et al. discloses a method of making microspheres of uranium oxide comprising a step of mixing uranyl nitrate, tetrahydrofurfuryl alcohol, furfuryl alcohol, acrolein, aq. ammonia and water at a room temperature (Col. 5, lines 34-39, Example 4). Although the concentration of THFA taught by Bezzi et al. is about 38%, it is considered to be a result effective variable, because, one of ordinary skill in the art would be expected to be able to adjust the concentration to afford high quality of microspheres of uranium oxides."

Bezzi et al. disclose the possible addition of THFA as follows in column 2, lines 7 to 15:

> "These may be used in mixtures among themselves or with co-polymerizing substances or graft co-polymers. If in the starting solution one would use a pre-polymerized and/or partly polymerized substance, it would be obtained by thermal polymerization and/or in acid or alkaline medium. If these substances are not miscible with the aqueous solutions of the thorium, uranium and plutonium salts, a substance such as tetrahydrofurfuryl alcohol, isopropyl alcohol and so on may be added."

Examples, 1, 2, 3 4 and 6 in Bezzi et al. disclose preparations which include THFA. Example 4 referred to in the Office Action discloses the largest addition of THFA (375 cc). Each of the other four Examples which disclose the use of THFA disclose the use of a smaller amount of THFA than the 375 cc of Example 4.

The percent of THFA disclosed in Example 4 is 34.9% by volume, which is calculated as follows.

The Example 4 disclosure in column 5, lines 25 to 57 of Bezzi et al. is summarized as follows:

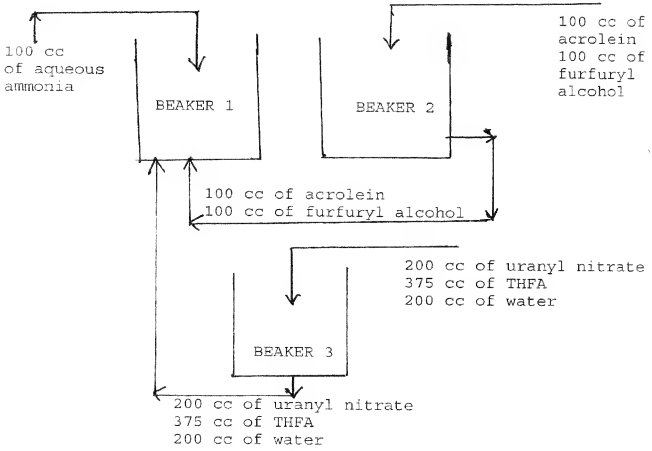
> (1) 100 cc of 8 wt% of aqueous ammonia are poured into beaker #1 (in column 5, lines 27 to 28).
>
> (2) A mixture of 100 cc of acrolein plus 100 cc of furfuryl alcohol prepared in beaker #2 is added to beaker #1 (in column 5, lines 29 to 31). Since the volume of the contents of beaker #2 is 200 cc, the volume of the contents of beaker #1 after this step is 300 cc (100 cc + 200 cc).
>
> (3) A mixture of 200 cc of uranyl nitrate, 375 cc of THFA and 200 cc of water, prepared in beaker #3 is poured into beaker #1 (in column 5, lines 35 to 39). The volume of the

contents of beaker # 3 is 775 cc (200 cc + 375 cc + 200 cc). Then the volume of the contents of beaker #1 after this step is 1075 cc (300 cc + 775 cc).

(4) After being left for about 15 hours, the solution in beaker #1 is dripped into 32-wt% of aqueous ammonia. See column 5, lines 40 to 46. Thus, the solution in beaker #1 corresponds to the feedstock liquid of applicant's presently claimed invention.

Since the volume of THFA added to the contents of beaker # 1 in step (3) is 375 cc, the total amount of tetrahydrofurfuryl alcohol in the feedstock liquid of Bezzi et al. is 34.9% by volume (375 cc/1075cc) based on the entire volume of the feedstock liquid.

Example 4 of Bezzi et al. refers to Examples 1 and 2 of Bezzi et al. The following schematic diagram shows the introduction and amounts of ingredients in Example 4 of Bezzi et al.

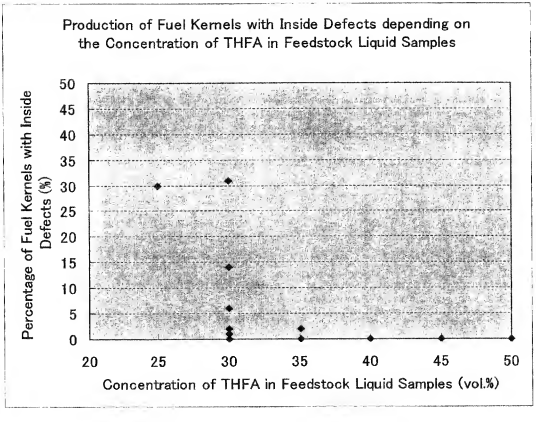


BEAKER 1 thus contains the following

100 cc	aqueous ammonia
100 cc	acrolein
100 cc	furfuryl alcohol
200 cc	uranyl nitrate
375 cc	THFA
200 cc	water
1075 cc	

$$\text{vol\% THFA} = \frac{375\ \text{cc}}{1075\ \text{cc}} \times 100 = 34.8\ \text{vol.\%}$$

The December 22, 2008 TAKAHASHI DECLARATION demonstrates that the fuel kernels obtained in the experiment had inside defects when the concentration of THFA in the corresponding feedstock liquid samples was 35 vol.% or less. See the figure on page 4 of the December 22, 2008 TAKAHASHI DECLARATION, which is reproduced as follows:



When fuel kernels have defects inside them, fission gas quickly reaches the coating layer, with which the fuel kernels are covered, through the defects such as cracks. Fuel particles having fuel kernels with more defects inside them are prone to leak fission gas through the coating layer. Once fission gas leaks out to the nuclear reactor, it quickly expands in the reactor, which may activate the safety system and shut down the reactor.

The applicant thus has demonstrated that the concentration of THFA of 40 to 505 by volume is critical to operate high-temperature gas reactors safely. Bezzi et al. teach neither applicant's claimed concentration range of THFA nor its critical effects.

The rejection based on a combination of Hideji et al. and Bezzi et al. is respectfully traversed on the basis that one of ordinary skill in the art would not consider to combine the references. Even assuming *arguendo* that the references are combinable in the manner set forth in the Office Action, the combined teachings of the references do not render obvious applicant's claimed invention. Each of these references

discloses the addition of THFA for a purpose which is different in each reference. Neither of the references disclose the addition of THFA for the same purpose as it is used in applicant's claimed invention. It is respectfully submitted that there are no disclosures in these references which would lead workers in this field attempting to make microspheres with fewer internal defects to applicant's presently claimed invention. Each of the Examples in Bezzi et al. utilizes an amount of THFA which would not have the effect of producing a product with fewer internal defects as established by the data in the December 22, 2008 TAKAHASHI DECLARATION.

The rejection based upon the combination of Hideji et al. and Bezzi et al. is further respectfully traversed on the ground that there are no teachings in these references which would lead workers having ordinary skill in the art to select them from the voluminous prior art and then combine them in the manner relied upon in the rejection and the modify the combined teachings to arrive at applicant's claimed invention.

It is therefore respectfully submitted that applicant's claims are not rendered obvious by Hideji et al. in view of Bezzi et al.

The rejection of claims 12 to 14 is traversed for the following reasons.

Larson et al. teach using an excess of HNO_3 in column 5, lines 12 to 13. When the molar ratio of HNO_3 to U_3O_8 is greater than 8, the molar ratio of HNO_3 to uranium is greater than 2.67. On the other hand, applicant's claim 12 requires that the molar ratio (A/B) of nitric acid (A) to uranium (B) be from 2.3 to 2.5.

As stated in paragraphs [0011] (page 4, line 22 to page 5, line 7) and [0014] (page 7, lines 17 to 22) of US 2007/0178036A1 (the published application of the above-identified application), one of the objectives of the presently claimed invention is to provide a method of preparing a uranyl nitrate solution, the method being capable of reducing the burden on the environment. The use of an excess amount of nitric acid means that the nitrogen content in the waste fluid is increased inevitably, which results in an increased burden on the environment.

Larson et al. teach that the reaction between HNO_3 and U_3O_8 takes place according to the formula:

$$U_3O_8 + 8HNO_3 \rightarrow 3UO_2(NO_3)_2 + 2NO_2 + 4H_2O$$

The stoichiometric molar ratio of HNO_3 to uranium is 2.67, or that of HNO_3 to U_3O_8 is 8 in this reaction. Therefore, if nitric acid in an amount less than 8 mol is used to 1 (one) mol of U_3O_8, part of U_3O_8 remains unreacted.

In order to reduce the nitrogen content in waste fluid, the present inventor made U_3O_8 react with HNO_3 according to both of the following formulae:

$$U_3O_8 + 8HNO_3 \rightarrow 3UO_2(NO_3)_2 + 2NO_2 + 4H_2O$$

$$3U_3O_8 + 20HNO_3 \rightarrow 9UO_2(NO_3)_2 + 2NO + 10H_2O$$

The stoichiometric molar ratio of HNO_3 to uranium is 2.22 in the lower formula. the combination of the two reactions reduces the molar ratio of HNO_3 to uranium to less than 2.67.

Larson et al. do not disclose the reaction according to the lower formula. Besides, Larson et al. recommend using an excess amount of nitric acid, which means that Larson et al. neither

teach reduction in the nitrogen content nor suggest the reaction according to the lower formula.

Larson et al. and McLean, II et al. do not disclose use of THFA.

It is respectfully submitted even when the references are combined in the manner relied upon in the rejection, the combined teachings do not render obvious applicant's claimed invention. Claim 12 depends from claim 3 and there are no teachings in the references which would render obvious the subject matter of applicant's claim 3 for the reasons discussed hereinbefore. The deficiencies of Larson et al. and McLean, II et al. as references are pointed out hereinbefore. It is therefore respectfully submitted that applicant's claims 12 to 14 are not rendered obvious by the combined disclosures of the references.

The rejection based upon these references is also respectfully traversed on the ground that there are no teachings in these references which would direct workers of ordinary skill in the art to combine the references in the manner relied upon in the rejection.

With respect to the rejection of claims 15 to 17 under 35 USC 103 over Hiroji JP 6-66756A, as noted above, independent claim 15 was amended to depend on claim 3, and claim 6 was canceled.

Since it is respectfully submitted that claim 3 is patentable, it follows that claims 15 and 17 should also be patentable.

Reconsideration of the rejection and allowance of the claims is solicited.

If the Examiner has any questions, comments, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

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